

While

While Loop

i = 3

```
while i > 0 :
```

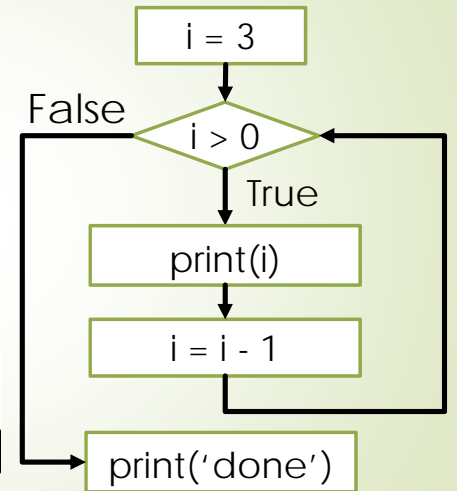
```
    print(i)
```

```
    i = i - 1
```

```
print( 'done' )
```

i ~~3~~ ~~2~~ ~~1~~ 0

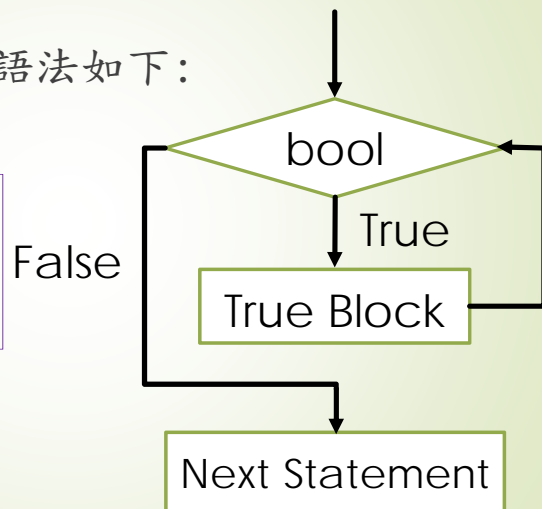
3
2
1
done
>>> |



While Loop

while loop的語法如下:

```
while bool:  
    True Block  
next statement
```



While Loop: Infinite Loop

```
i = 0  
while i < 5:  
    print(i)  
    i = i + 1  
print('done')
```

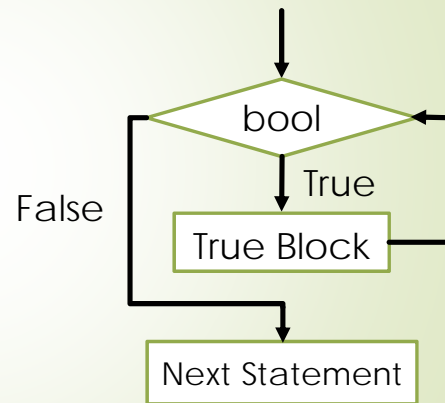
>>>
0
1
2
3
4
done
>>>

```
# What happen  
i = 0  
while i > 5:  
    print(i)  
    i = i + 1  
print('done')
```

```
# What happen  
i = 0  
while i >= 0:  
    print(i)  
    i = i + 1  
print('done')
```

While Loop: 如何設計?

- 要使用while loop，有兩個重點：
 - 如何設計loop:基本上要了解如何讓loop結束，而且一定要能結束
 - 如何設計True Block:這一點是要尋找問題的pattern，將可以重複計算的部分放在loop中。



While Loop: Example 2

- while loop可以模擬for loop。
- 請計算 $1+2+3+\dots+100$

```
sum = 0
for i in range(1, 101):
    sum = sum + i
print('sum = ', sum)
```

```
>>>
sum = 5050
>>> |
```

```
sum = 0
i = 1
while i < 101:
    sum = sum + i
    i = i + 1
print('sum = ', sum)
```

While Loop: Example 1

- 請將1到100之間的7的倍數印出來

Brute Force

```
n = 7
for i in range(1,101):
    if i%n==0:
        print(i, end=' ')
print('done')
```

```
>>>
7 14 21 28 35 42 49 56 63 70 77 84 91 98 done
>>>
```

7*i

```
i = n = 7
while i<101:
    print(i)
    i = i + 7
print('done')
```

While Loop: Example 3

- 有一個井高六公尺，有隻烏龜在井底，白天往上爬三公尺，晚上因為睡覺會滑落一公尺，請問烏龜要爬幾天才能爬出井？
- 我們定義了兩個變數：
 - top: 烏龜爬到位置離井底的距離
 - day: 紀錄已經爬了幾天

想法: loop的設計是要尋找pattern，將重複的事在loop裡完成。

- 先給定初始值top = day = 0(還沒開始爬，也還沒開始計算日數)
- 當白天來了就往上爬(top = top + 3)，此時如果超過井的深度距離，表示爬到了井的頂部(top>6)，跳出loop，將天數顯示出來。
- 當白天過了，沒爬到頂部，紀錄了晚上滑下一公尺，重複步驟2(新的一天又開始了)

```
day = 0
```

```
top = 0
```

```
while(top < 6):
```

```
    top = top + 3
```

```
    day = day + 1
```

```
    if top > 6:
```

```
        break;
```

```
    top = top - 1
```

```
print('It takes ', day, 'days')
```

